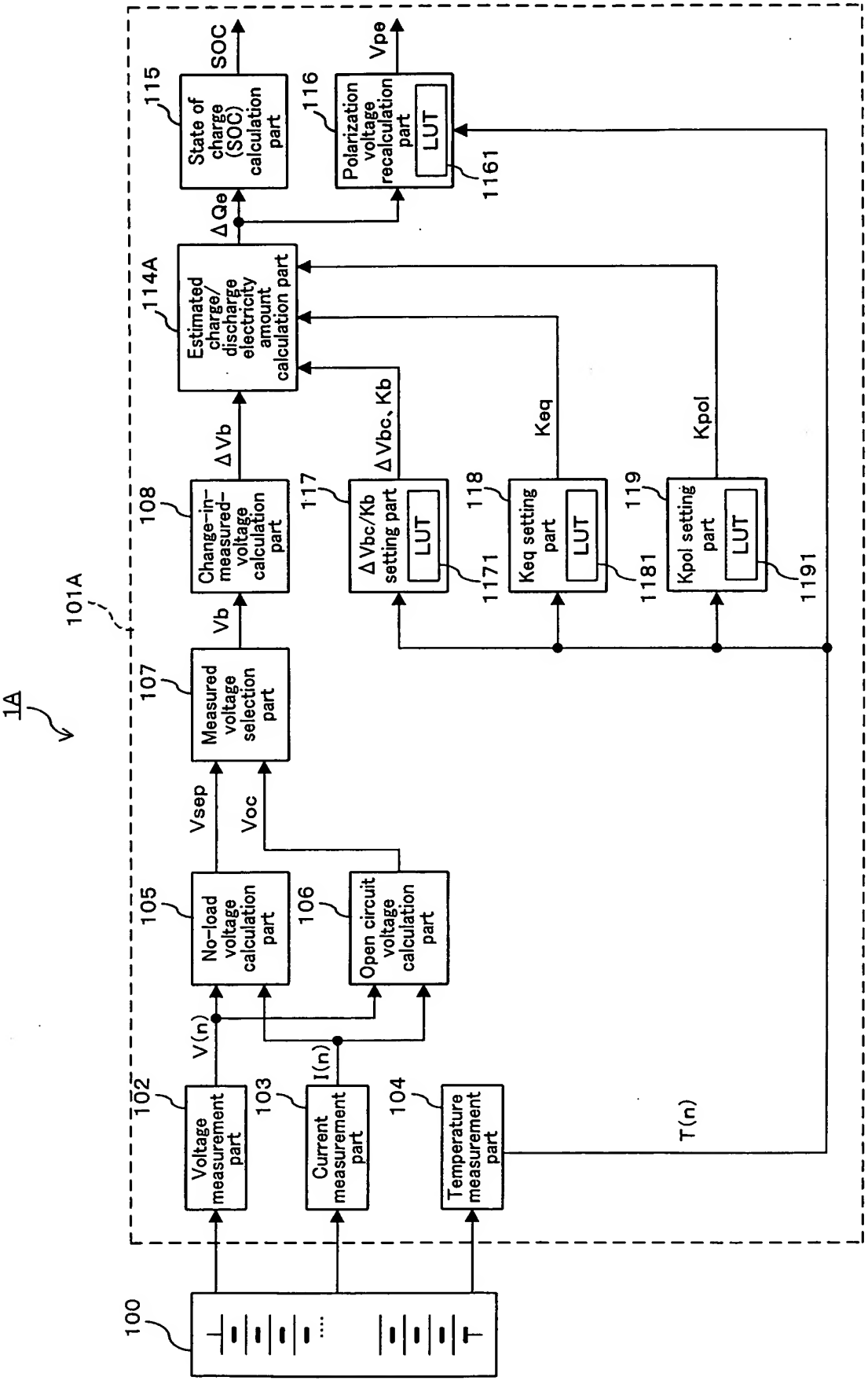
1A
101A
100
102
Voltage measurement part
103
Current measurement part
104
Temperature measurement part
V(n)
I(n)
T(n)
105
No-load voltage calculation part
106
Open circuit voltage calculation part
Vsep
Voc
107
Measured voltage selection part
Vb
108
Change-in-measured-voltage calculation part
ΔVb
114A
Estimated charge/discharge electricity amount calculation part
ΔQe
115
State of charge (SOC) calculation part
SOC
116
Polarization voltage recalculation part
LUT
1161
Vpe
117
ΔVbc/Kb setting part
LUT
1171
ΔVbc, Kb
118
Keq setting part
LUT
1181
Keq
119
Kpol setting part
LUT
1191
Kpol

FIG. 1

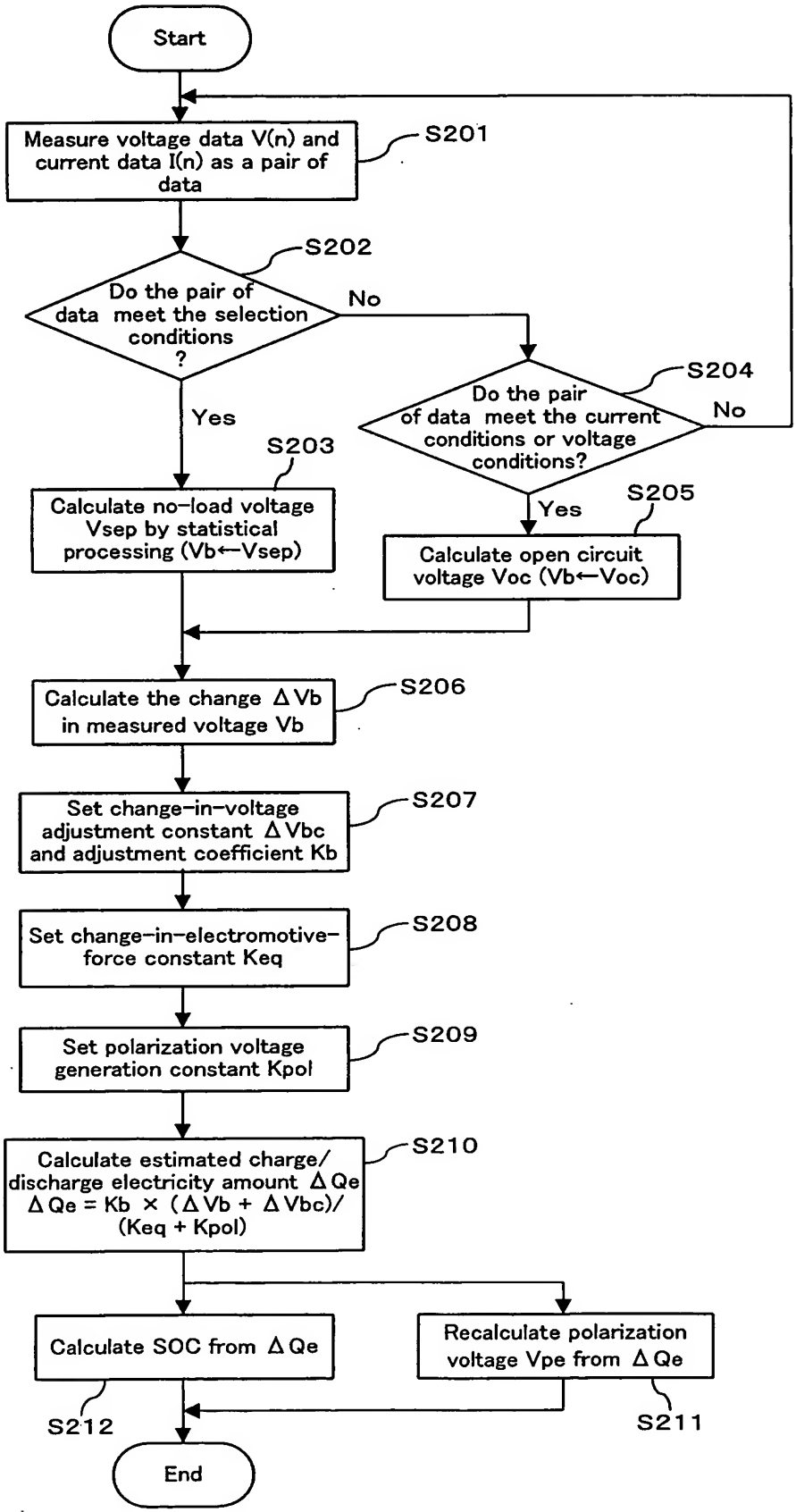
Start
Measure voltage data V(n) and current data I(n) as a pair of data
S201
Do the pair of data meet the selection conditions ?
S202
No
Yes
Do the pair of data meet the current conditions or voltage conditions?
S204
No
Yes
Calculate no-load voltage Vsep by statistical processing (Vb←Vsep)
S203
Calculate open circuit voltage Voc (Vb←Voc)
S205
Calculate the change ΔVb in measured voltage Vb
S206
Set change-in-voltage adjustment constant ΔVbc and adjustment coefficient Kb
S207
Set change-in-electromotive-force constant Keq
S208
Set polarization voltage generation constant Kpol
S209
Calculate estimated charge/discharge electricity amount ΔQe
ΔQe = Kb × (ΔVb + ΔVbc)/(Keq + Kpol)
S210
Calculate SOC from ΔQe
Recalculate polarization voltage Vpe from ΔQe
S212
S211
End

FIG.2

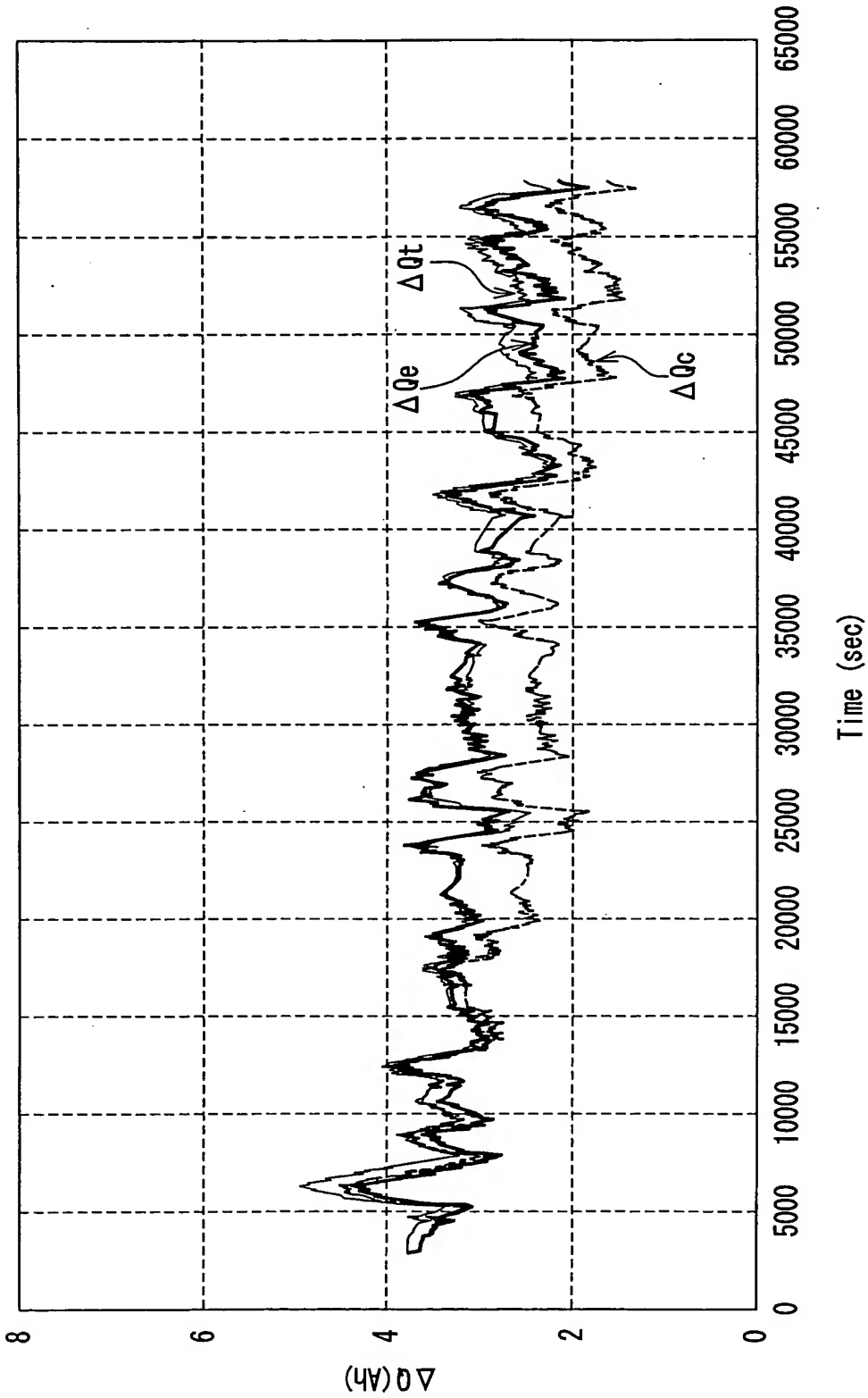
ΔQt
ΔQe
ΔQc
ΔQ (Ah)
8
6
4
2
0
0
5000
10000
15000
20000
25000
30000
35000
40000
45000
50000
55000
60000
65000
Time (sec)

FIG. 3

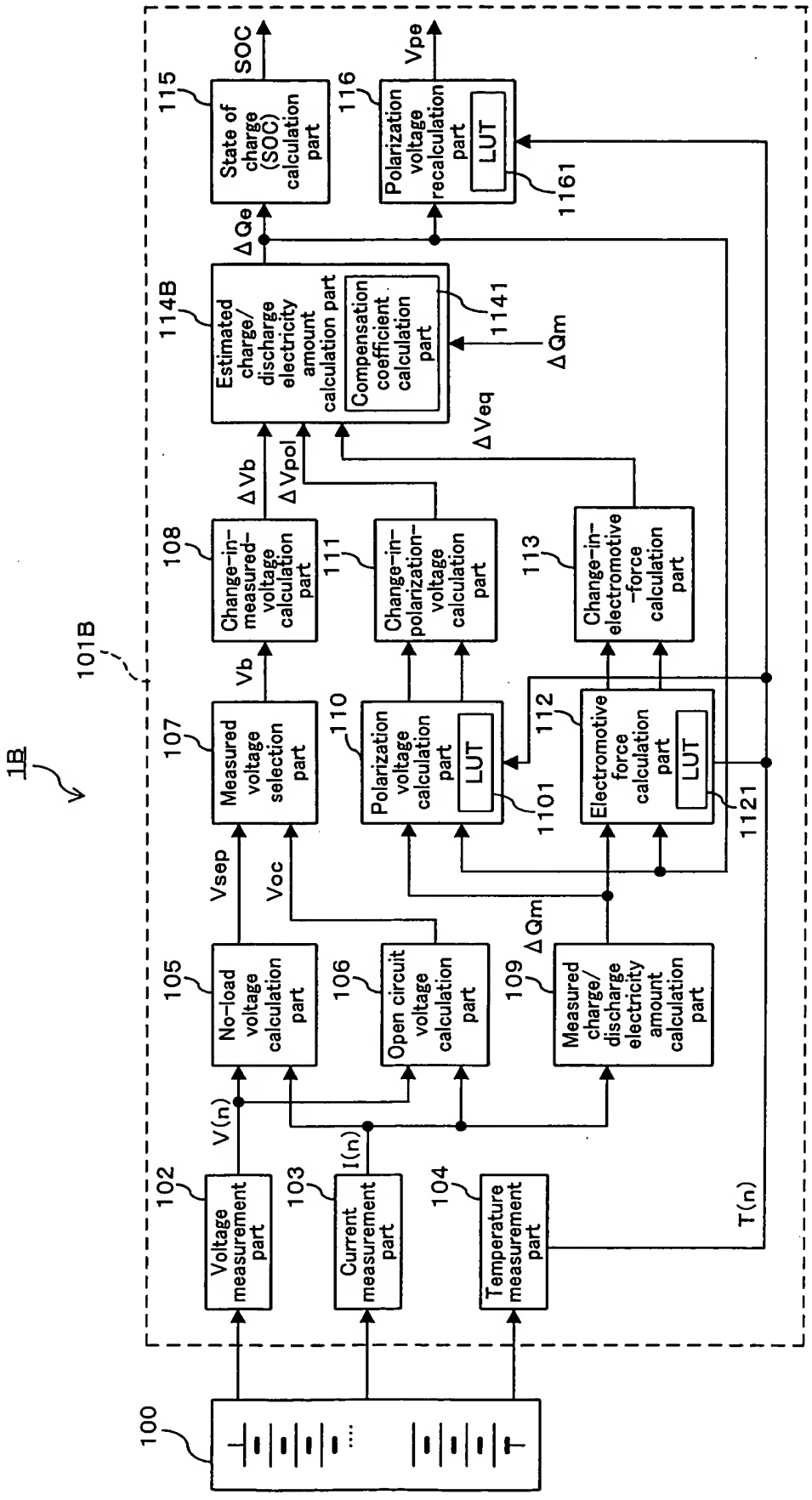
1B
101B
100
102 Voltage measurement part
103 Current measurement part
104 Temperature measurement part
105 No-load voltage calculation part
106 Open circuit voltage calculation part
107 Measured voltage selection part
108 Change-in-measured-voltage calculation part
109 Measured charge/discharge electricity amount calculation part
110 Polarization voltage calculation part
LUT
1101
111 Change-in-polarization-voltage calculation part
112 Electromotive force calculation part
LUT
1121
113 Change-in-electromotive-force calculation part
114B Estimated charge/discharge electricity amount calculation part
Compensation coefficient calculation part
1141
115 State of charge (SOC) calculation part
116 Polarization voltage recalculation part
LUT
1161
V(n)
I(n)
T(n)
Vsep
Voc
Vb
ΔVb
ΔVpol
ΔVeq
ΔQm
ΔQe
SOC
Vpe

FIG.4

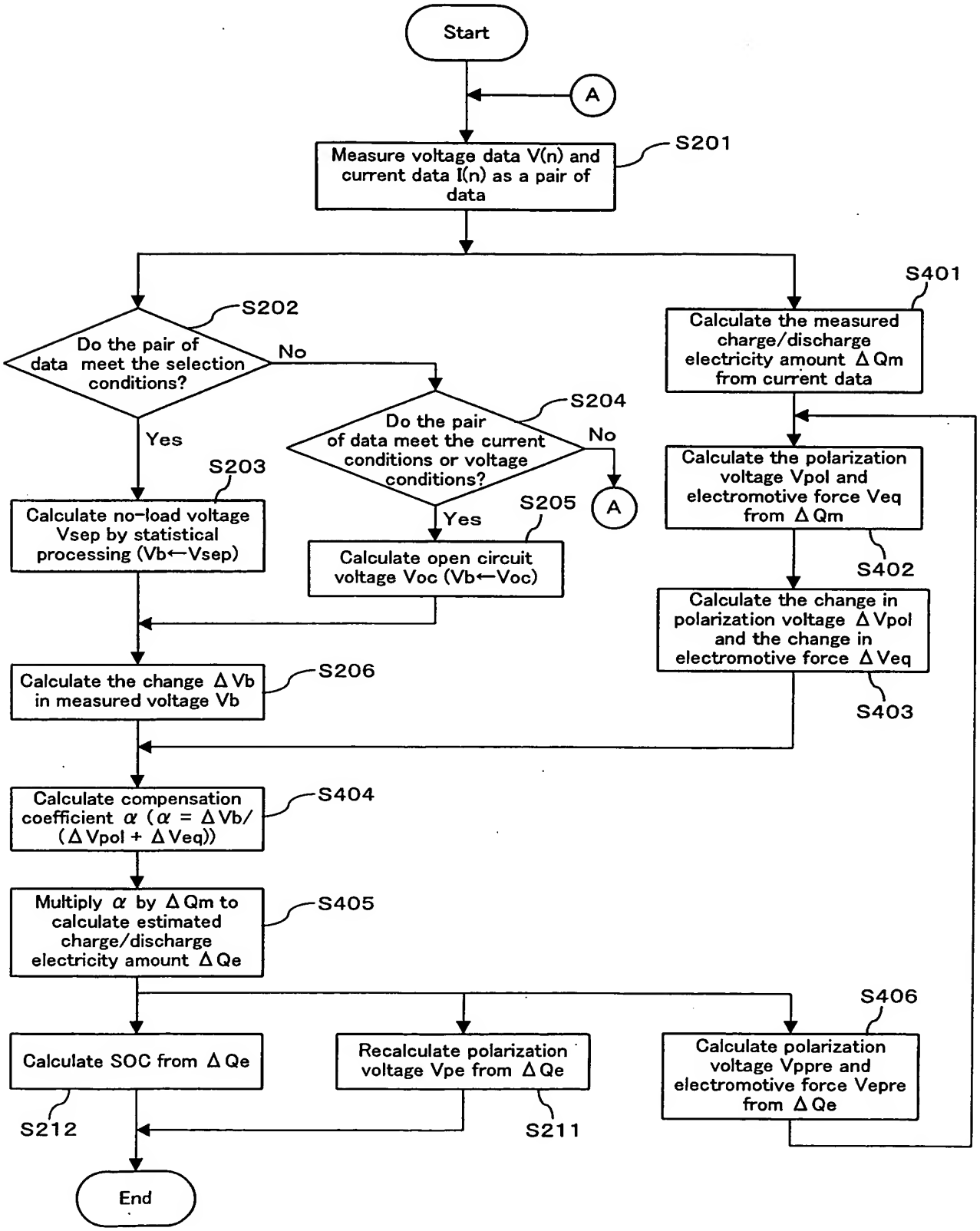
Start
A
Measure voltage data V(n) and current data I(n) as a pair of data
S201
S401
Calculate the measured charge/discharge electricity amount ΔQm from current data
S202
Do the pair of data meet the selection conditions?
No
Yes
S204
Do the pair of data meet the current conditions or voltage conditions?
No
Yes
A
S203
Calculate no-load voltage Vsep by statistical processing (Vb←Vsep)
S205
Calculate open circuit voltage Voc (Vb←Voc)
Calculate the polarization voltage Vpol and electromotive force Veq from ΔQm
S402
Calculate the change in polarization voltage ΔVpol and the change in electromotive force ΔVeq
S403
Calculate the change ΔVb in measured voltage Vb
S206
Calculate compensation coefficient α (α = ΔVb/(ΔVpol + ΔVeq))
S404
Multiply α by ΔQm to calculate estimated charge/discharge electricity amount ΔQe
S405
S406
Calculate SOC from ΔQe
Recalculate polarization voltage Vpe from ΔQe
Calculate polarization voltage Vppre and electromotive force Vepre from ΔQe
S212
S211
End

FIG.5

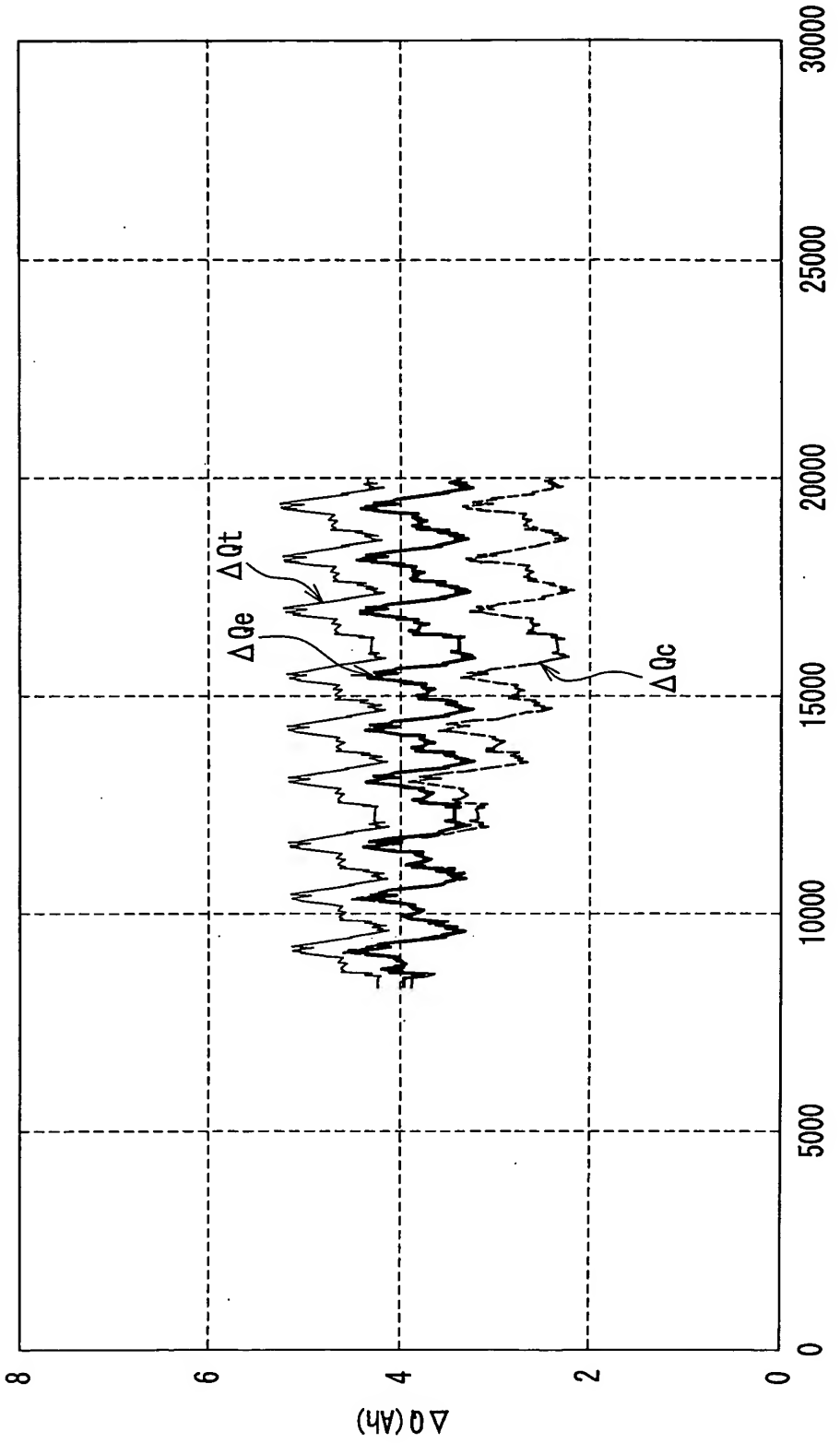
ΔQ (Ah)
8
6
4
2
0
Time (sec)
0
5000
10000
15000
20000
25000
30000
ΔQt
ΔQe
ΔQc

FIG. 6